



LM26-16M

HD/SD-SDI Level Metering Unit

(Document P/N 821617 Rev-A)

Sixteen Channels, HD/SD-SDI Input and
Re-clocked Output on BNC, Signal Lock LEDs,
and Sixteen 26-Segment High-Resolution
LED Bargraph Level Meters

User Manual

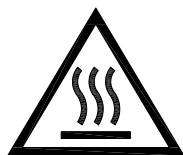
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Important Safety Instructions

- 1) Read these instructions.
- 2) Keep these instructions.
- 3) Heed all warnings.
- 4) Follow all instructions.
- 5) Do not use this apparatus near water.
- 6) Clean only with dry cloth.
- 7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- 8) Do not install near any heat source such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- 9) Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- 10) Protect the power cord from being walked on or pinched, particularly at plugs convenience receptacles and the point where they exit from the apparatus.
- 11) Only use attachments/accessories specified by the manufacturer.
- 12) Use only with the cart stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
- 13) Unplug this apparatus during lightning storms or when unused for long periods of time.
- 14) Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- 15) Do not expose this apparatus to rain or moisture.
- 16) The apparatus shall be connected to a mains socket outlet with a protective earthing connection.

CAUTION!



In products featuring an audio amplifier and speakers, the surface at the side of the unit, where the audio amplifier heat sink is internally attached, may get very hot after extended operation. When operating the unit exercise caution when touching this surface and ensure that external materials which may be adversely affected by heat are not in contact with it. There is a Hot Surface label (see diagram) attached to the aforementioned surface of the product.

Introduction

Congratulations on your selection of a Wohler Technologies product. We are confident it represents the best performance and value available, and we guarantee your satisfaction with it.

If you have questions or comments you may contact us at:

Wohler Technologies, Inc.

31055 Huntwood Avenue

Hayward, CA 94544

Phone: (510) 870-0810 Fax: (510) 870-0811

US Toll-Free: 1-888-596-4537

www.wohler.com **support@wohler.com**

Section 1

General Features and Specifications

Description

Features

Applications

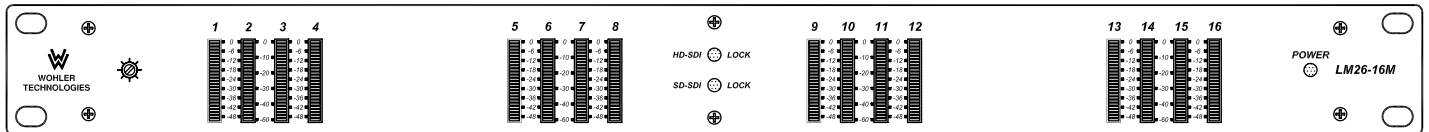
Specifications

Installation



LM26-16M

16-Channel HD/SD-SDI Digital Level Metering Unit



LM26-16M Front Panel

Description

The **LM26-16M** is a single rack (1U) digital **HD/SD-SDI** audio level metering unit. It features one unbalanced input with an impedance of 75 Ω (ohm) and one re-clocked output, both on female BNC connectors. The input accepts either **SD-SDI** or **HD-SDI** digital signals and is adjustable for **Reference Level** gain via rear panel DIP switch modules. Signal lock status is indicated by two separate LEDs on the front panel; one for **SD-SDI** signals and one for **HD-SDI** signals.

The sixteen vertical audio level meters are 26-segment high-resolution tri-color (red/amber/green) LED bargraph displays with a wide dynamic range. The display mode is factory set as a single segment **PPM 'dot'** above a **VU bar**; each segments color is fixed according to its position on the scale. However, each 4-channel bargraph meter section may be individually adjusted for a number of parameters, including **Display Mode**, **Peak Hold**, **PPM Ballistics**, and **Alternate Scales** via rear panel and internal DIP switch modules. A recessed trimpot on the front panel is used to adjust the brightness of the eight LED bargraph displays.

Features

- Sixteen 26-segment tri-color bargraph level meters provide wide dynamic range
- One HD/SD-SDI input on BNC connector
- One re-clocked output on BNC connector
- Separate lock status LEDs for SD-SDI and HD-SDI input signals
- Front panel power indication LED
- Front panel bargraph brightness control
- Selectable input **Reference Level** (-9, -18, or -20 dBfs)
- Selectable **Display Mode** (VU-VU Floating Segment, VU-PPM Floating Segment, PPM Only, or PPM-PPM Floating Segment)
- Selectable **Peak Hold** (Manual, 3-Second, 10-Second, or Off)
- Selectable **PPM Ballistics** (Type I, Type II, DIN 45406, or SSRT)
- Selectable alternate **Bargraph Scales** (AES, VU, BBC, NORDIC, or DIN)

Applications

The **LM-M Series** of **HD/SD-SDI** level metering units are an adaptable and effective way to monitor **SD-SDI** and **HD-SDI** digital audio in many applications. The following are some of the applications where an **LM Digital Series** unit would prove valuable.

- Radio Broadcast Station
- TV Control Room
- Mobile Broadcast unit
- Remote Radio Station
- Sound Staging development
- Recording Studio
- Cinema
- Theatrical Staging
- Music Design Application
- Broadcasting Schools
- Home Theater
- Any Aural Media applications

Specifications

Level Meter Type:	26-Segment LED bargraph
Level Gain (DIP switch selectable):	-9, -18, -20 dBfs
Bargraph Length:	1.078" (27.85 mm)
LED Segment Size:	0.14" x 0.028" (3.57 x 0.7 mm)
LED Segment Pitch:	0.041" (1.05 mm)
Segment Display Color:	Tri-color (red, amber, green)
Peak Emmision Wavelength:	Green: 570 nm, Red: 630 nm
Segment Brighness, (If = 20 mA):	3.5 mcd
Segment Brightness, Uniformity:	<10% difference between segments
Adjacent Segment "Off" Brightness:	<1% of brightness of active segment
Dynamic Range, AES Scale (Standard Digital):	60 dB
Midscale Resolution, AES Scale (Standard Digital):	2 dB
Input Connectors:	Female BNC x 1
Input Impedance:	75 Ω unbalanced
Input Signal Types:	SD-SDI (SMPTE259M @ 270 Mb/s) HD-SDI (SMPTE292M @ 1.5 Gb/s)
Maximum Equalized Cable Length:	Belden 8281 - 100m @ 1.48 Gb/s and 280m @ 270 Mb/s Belden 1694A - 140m @ 1.48 Gb/s and 350m @ 270 Mb/s
Return Loss:	>15 dB from 5 MHz to 2 Ghz
Signal Level:	800 mVp-p - 10%, +18%
Output Connector:	1 x BNC Female BNC
Signal Level:	800 mVp-p +/- 7%
Rise/Fall Time:	800 ps (max)
Overshoot:	8% (max)
Wideband Jitter:	<0.02 Ulp-p (typ.)
AC Mains Power:	100-250 VAC, 50/60 Hz universal input, auto-switch
Power Consumption:	25 watts (1U)
Dimensions:	3.5 x 19 x 8" (89 x 483 x 203 mm)
Weight:	8 lbs (3.5 kg)

Units are certified to meet, at time of manufacture, all currently applicable product safety and EMC requirements, such as those of CE. 0 dbv ref. 0.775V RMS. Features and specifications subject to improvement without notice.

Installation

Mounting

The unit should be mounted where convenient for operating persons, ideally at approximately eye level for best viewing.

Heat Dissipation

No special considerations for cooling are necessary as long as the ambient temperature inside the rack area does not exceed approximately 40°C (104°F). Note that if the internal heat becomes elevated in the **LM Series** unit, it is advised to *lower* the brightness of the LED bargraph level meters using the **Bargraph Brightness Adjust Control (Item 1, page 8)** as this can significantly reduce the heat generated inside the chassis.

Mechanical Bracing

The chassis is securely attached to the front panel at six points along its surface, not just at the four corners of the chassis ears. This feature will reduce or eliminate rear bracing requirements in most mobile/portable applications. The weight of internal components is distributed fairly evenly around the unit.

Audio Connections

Connection of the audio feeds is straightforward. The system interconnect block diagram located on page **17** may be referred to for clarification of the general signal paths into the **LM Series** units.

Electrical Interference

As with any audio equipment, maximum immunity from electrical interference requires the use of shielded cable; however, satisfactory results can sometimes be obtained without it. The internal circuitry common is connected to the chassis.

AC Power

The unit's AC mains connection is via a standard IEC inlet, with safety ground connected directly to the unit's chassis. The universal AC input (100-240VAC, 50/60 Hz) switching power supply is a self-resetting sealed type, with automatic over-voltage and over-current shutdown. There is no user-replaceable fuse in either the primary or secondary circuit.

Level Meter Parameter Settings

The **Peak Hold**, **PPM Ballistics**, and **Alternate Scale** level meter settings are selected using a DIP switch accessible *only* by removing the top cover of the unit. Should the user wish to change these settings, it should be done *before* installation into an enclosed rack or difficult to access area. See page **14** for setting information.

The input **Termination**, **Reference Level Gain** calibration, and bargraph **Display Mode** settings may be selected *after* installation via the DIP switch(es) on the rear panel as long as the rear panel is easily accessible. If installation makes the rear panel difficult to access, then these adjustments should be made *before* installation. See page **10** for setting information.

Section 2

Operation

Installation

Front Panel Features

Rear Panel Features

Front Panel Features

Please refer to **Figure-2a** on the following page to familiarize yourself with the front panel features of the **LM26-16M** unit. The following sections describe these features and are referenced, by number, to **Figure-2a**.

1 Bargraph Brightness Control

This control is recessed into the front panel and can be accessed using a small flathead screwdriver. Turning it clockwise will increase the relative brightness of the bargraph LED segments. Adjusting this one control will simultaneously affect the brightness of all bargraph displays on the front panel.

2 Audio Level Meters

Audio levels for the sixteen source channels are displayed via sixteen 26-segment high-resolution tri-color LED bargraph meters. Channel numbers (**1.....16**) are silk-screened above the corresponding bargraphs.

All bargraph LED segments are of the tri-color type (green, amber, red). Each of the four 4-channel bargraph sections is user adjustable for **Reference Level**, **Display Mode**, **Peak Hold**, **PPM Ballistics**, and **Alternate Bargraph Scales** via DIP switches on the rear panel and inside the unit. See pages **10** and **14** for more information regarding level meter DIP switch settings.

3 Input Signal Lock LEDs (SD-SDI and HD-SDI)

One of these two LEDs will glow GREEN to indicate that the applicable type of input signal (**SD-SDI** or **HD-SDI**) entering the **SDI Input Connector** (Item B, page 10) is *locked*.

4 Power LED

This LED glows GREEN to indicate the unit is connected to mains power and an operation voltage is present.

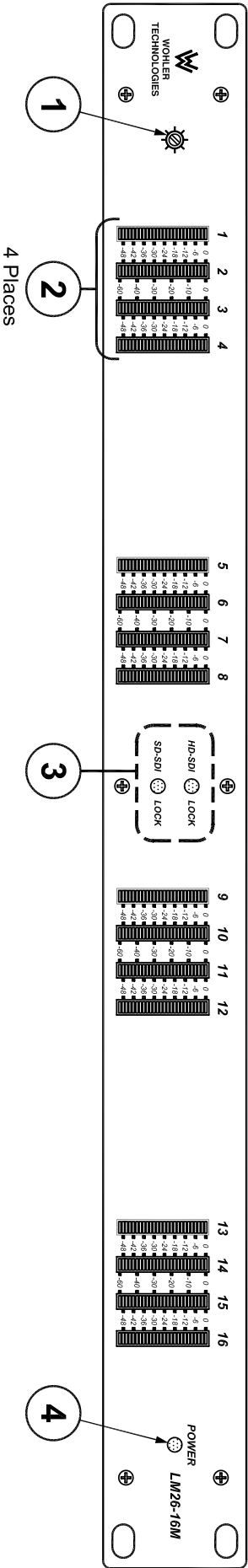


Figure-2a: LM26-16M Front Panel Features

Rear Panel Features

Please refer to **Figure-2b** on the following page to familiarize yourself with the rear panel features of the **LM26-16M** unit. The following sections describe these features and are referenced, by letter, to **Figure-2b**.

A DIP Switch - Rear Panel

These DIP switch modules are used to select the bargraph **Reference Level** and **Display Mode** for the associated **Level Meters** on the front panel. Note that each of the four DIP switch modules affects one four-channel section. See the descriptions and diagram below for setting information. Note that DIP switch sections **1** and **6** are not used.

Reference Level:

DIP switch sections **2** and **3** determine the **Reference Level**, which adjusts the level of the input signal and the resultant level displayed on the **Level Meters**. Factory setting is **-20 dBfs**. See the diagram below for other settings, including **-9** and **-18 dBfs**.

Bargraph Display Modes:

DIP switch sections **4** and **5** determine how peak levels are displayed for the associated **Level Meters** on the front panel. There are *four* possible settings:

- VU-VU Floating Segment
- VU-PPM Floating Segment
- PPM Only
- PPM-PPM Floating Segment

The **VU-VU Floating Segment** selection has a **VU** floating segment when a **Peak Hold** value is selected using the **Internal 10-Position DIP Switch Module** (see page 14). The **PPM Only** selection has a **PPM** floating segment when a **Peak Hold** value is selected. The factory default setting is **VU-PPM Floating Segment**. See diagram below for settings.

LM-M HD/SD-SDI Rear Panel DIP Switch Settings											
Reference Level						Display Mode					
x	2	3			x	x		4	5		x
1	2	3	4	5	6	1	2	3	4	5	6

Note: DIP sections **1** and **6** are not used.

B SDI Input Connector

This BNC connector input is configured for a **75 Ω** unbalanced connection and accepts **HD-SDI** (High-Definition, **1.5 GB/s**) *or* **SD-SDI** (Standard, **270 MB/s**) digital audio signals.

When an **SDI** signal entering the unit is *locked*, either the **SD-SDI Lock** *or* **HD-SDI Lock** LED on the front panel (**Item 3**, page 8) will light up GREEN, to indicate the type of **SDI** input signal (**SD-SDI** or **HD-SDI**).

C SDI Output Connector

This connector outputs a re-clocked copy of the **SD-SDI** *or* **HD-SDI** signal fed to the **SDI Input Connector** (**Item B**).

D Power Connector

Attach the supplied **IEC-320 power cord** between this connector and mains power (**100 - 240VAC** nominal, **50/60 Hz**). The front panel **Power LED** (**Item 4**, page 8) will glow GREEN to indicate operating voltages are present.

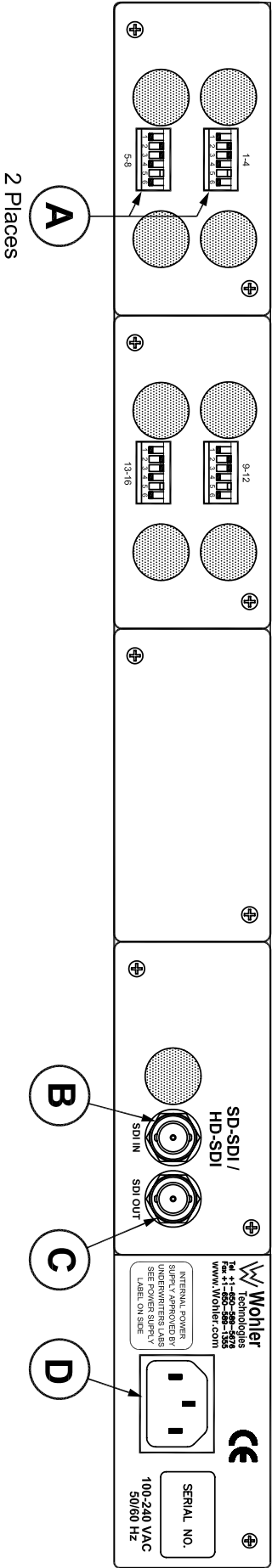


Figure-2b: Rear Panel Features

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Section 3

Technical Information

Level Meter Internal 10-Position DIP Switch Settings

Level Meter DIP Switch Locations

Level Meter Alternate Scales

LM26-16M Interconnect Block Diagrams

Level Meter Internal 10-Position DIP Switch Settings

This 10-position DIP switch is accessed by removing the top cover of the **LM** unit and is located on the **919175** PCB (the same PCB on which the 6-position rear panel DIP switch is located). See **Figure-3a**, page **15** for a diagram of the **919175** PCB and the DIP switch locations.

LM26-M HD/SD-SDI Level Meter Internal 10-Position DIP Switch Settings					
Scale Selection		Peak Hold (Bargraph Display)		PPM Ballistics (Bargraph Display)	
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Notes:

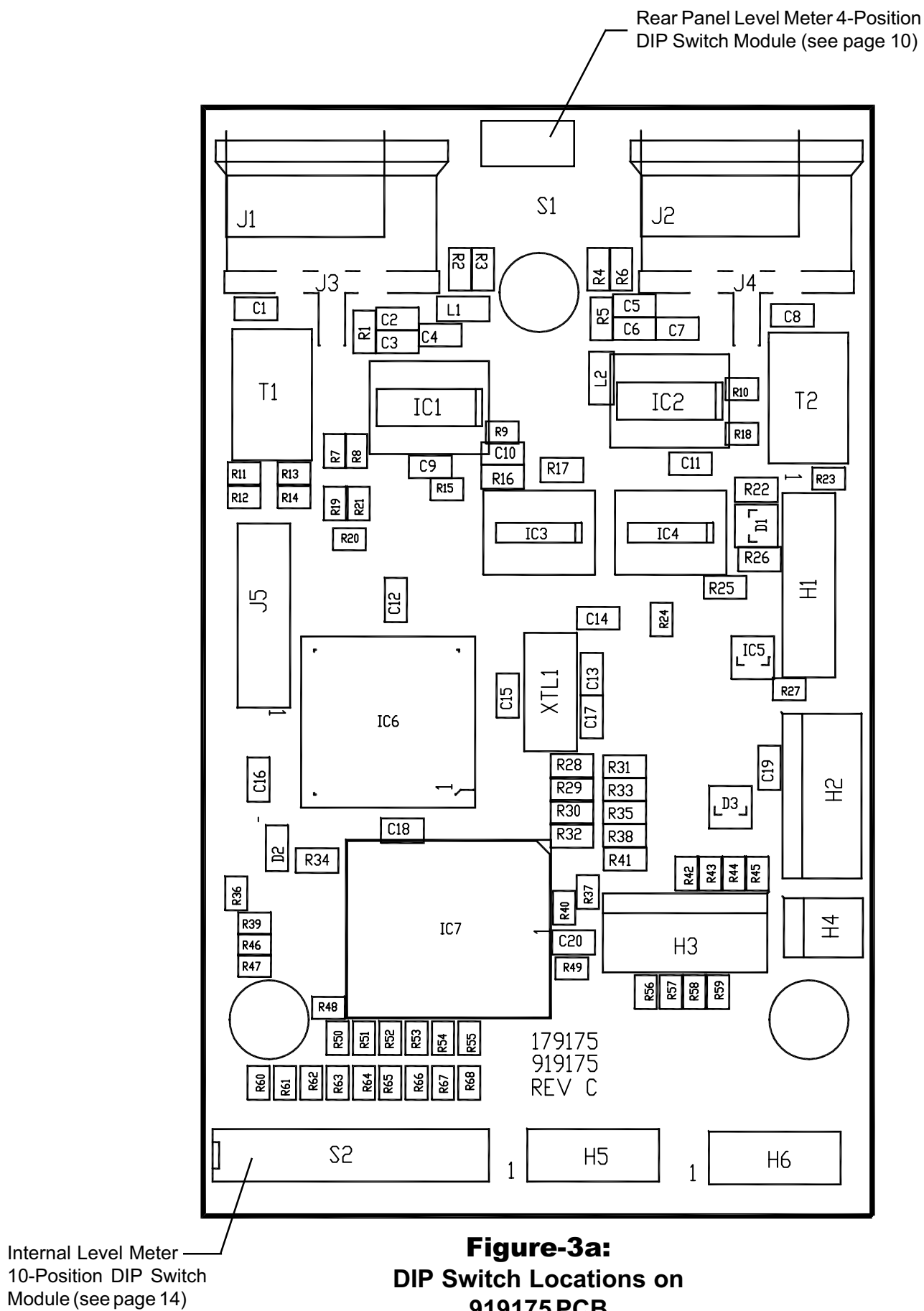
- Switch positions **1**, **9**, and **10** are NOT used and should be left at the factory set position.
- The **Peak Hold - Manual** setting allows the bargraph display meters to indefinitely maintain the peak hold value until it is reset by the operator, either by pressing a reset button (a special option specified at time of order) or by removing power and then reapplying power to the unit (unplugging/replugging power cord). Contact Wohler for more information about this feature.

PPM Characteristics (Ballistics):

The **PPM** characteristics determine the **Integration Time** (rise time) and **Return Time** (fall time) of the level meter. The **Integration Time** is the time it takes for the lighted segments of the level meter, after application of a 5 KHz tone at a certain reference level, to *rise* within a specified number of dB of that level. **Return Time** is the time it takes for the lighted segments of the level meter to *fall* a certain number of dB after removal of a 5 KHz tone of a certain reference level. The **PPM** characteristics available for selection using DIP switch sections **7** and **8** of the 10-position **Internal DIP Switch** (as shown in the above diagram) are as follows:

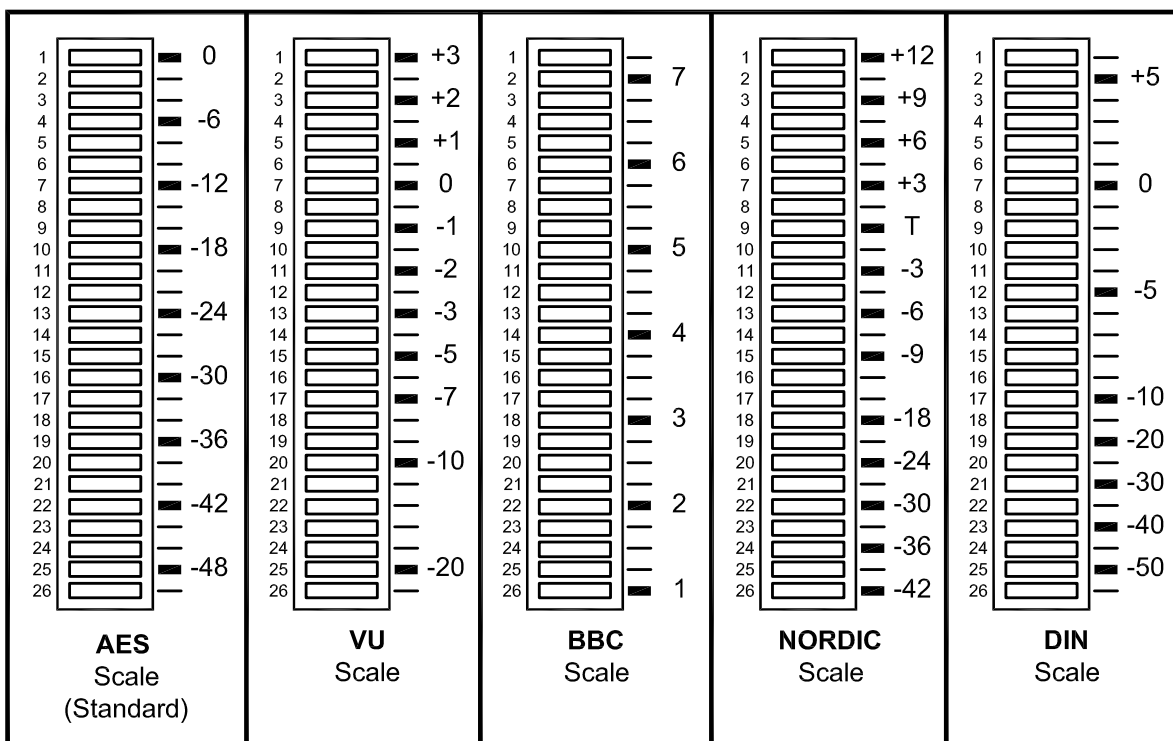
IEC268-10, Type 1:	Integration Time is 5 ms (-2 dB), Return Time is 1.7 seconds (20 dB)
IEC268-10, Type 2:	Integration Time is 10 ms (-2 dB), Return Time is 2.8 seconds (24 dB)
DIN 45406:	Integration Time is 5 ms (-2 dB), Return Time is 1.5 seconds (20 dB)
Single Sample:	Integration Time is a single sample, Return Time is 1.5 seconds (20 dB)

Level Meter DIP Switch Locations

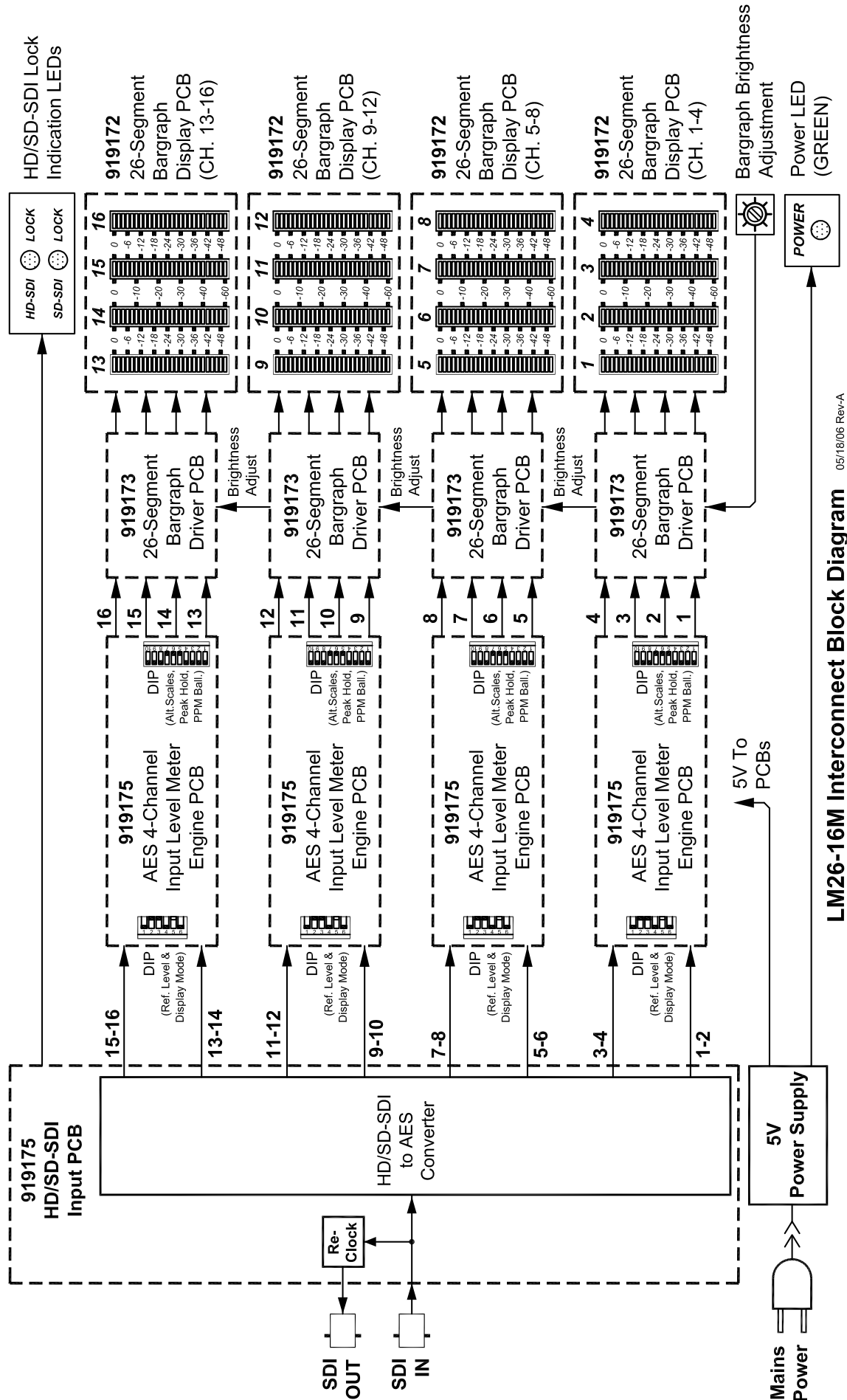


26-Segment LED Display Alternative Scales

The standard scale used on the **LM26-M Series** level meters (26-segment) is the **AES** scale (see diagram below). However, if alternative scale characteristics are selected for the level meters using the **Level Meter Internal 10-Position DIP Switch** (page 14), it is recommended that a label with the appropriate scale be applied to the front panel LED bargraph level meters. See diagram below for scale comparison. Scales selection includes the **AES**, **VU**, **BBC**, **NORDIC**, **DIN**, and **Custom** (not shown) scales. Contact **Wohler Technologies** for information about these alternative scale labels.



LM26-16M Interconnect Block Diagram



05/18/06 Rev-A

LM26-16M Interconnect Block Diagram



Wohler Technologies, Inc.

31055 Huntwood Avenue

Hayward, CA 94544

Phone: (510) 870-0810 Fax: (510) 870-0811

US Toll-Free: 1-888-596-4537

www.wohler.com **support@wohler.com**